



Streamflow Forecasting: Days to seasons

Introduction

The Bureau of Meteorology (Bureau) is the lead agency for providing Australia's flood forecasting and warning services. Work is underway to expand these services by generating continuous short-term and seasonal streamflow forecasts of how much water is likely to flow down rivers in the days and seasons ahead.

Short-term water forecasts

Short-term water forecasts will provide continuous streamflow forecasts for seven to ten days ahead. These will improve decision-making, lead to increased economic benefits through more efficient irrigation allocations, help ensure environmental flow objectives are met and improve information for recreational users.

Better information about future natural streamflows helps to prevent unnecessary releases and provides opportunities to extract water during local flow peaks.

The forecasts will complement the Bureau's seven-day rainfall forecasts and the flood forecasting and warning service.

Seasonal streamflow forecasts

Seasonal streamflow forecasts will help water managers and key water users improve their water management and decision-making capability. Reliable seasonal streamflow forecasts for weeks to several months ahead can influence important decisions such as:

- water allocations
- cropping strategies
- water market planning
- environmental watering
- operating a diversified water supply scheme
- restricting water supply
- managing drought.

Seasonal streamflow forecasts will complement the Bureau's seasonal rainfall and temperature outlook services.

An example of one of the experimental seasonal streamflow forecast products for the total flows of the Ovens River into the Murray River is shown in Figure 1. This figure shows a shift in the odds towards high streamflows for the March to May 2010 'season' as the forecast distribution shifts towards higher streamflows compared to the historical.

How are forecasts improving?

In short-term forecasting, the next seven to ten days of streamflow at a particular river location depends on how much water from previous rainfall in the catchment 'runs off' in that period, as well as flow generated by possible future rainfall.

Being able to forecast streamflow requires modelling how much rainfall runs off the ground into the streams, soaks into the soil or is lost through evaporation and other means. Future streamflows are estimated by these models using past and forecast rainfalls.

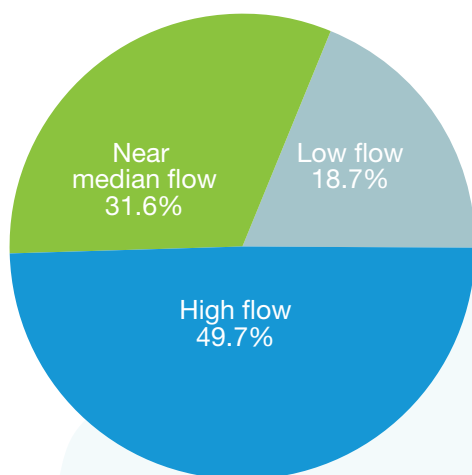
The Bureau's seasonal forecasts rely on new statistical and dynamic modelling approaches, currently being developed by CSIRO under the Water Information Research and Development Alliance (WIRADA).

The statistical approach is based on the Bayesian Joint Probability (BJP) modelling system. The BJP uses statistical relationships between climate indicators, past catchment conditions and historical rainfall and streamflow at a site to forecast its future streamflow.

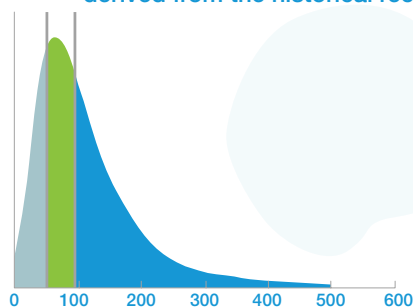
With the dynamic modelling approach, future streamflows are forecast by applying climate predictions from global climate models to hydrological models.

All forecasts contain uncertainty due to a range of factors. Information on the amount of uncertainty associated with each forecast will also be provided to users.

Forecast probabilities of receiving streamflow in the tercile categories of below average, near average and above average streamflow



Forecast distribution with tercile categories derived from the historical record



Historical distribution with tercile categories derived from the historical record

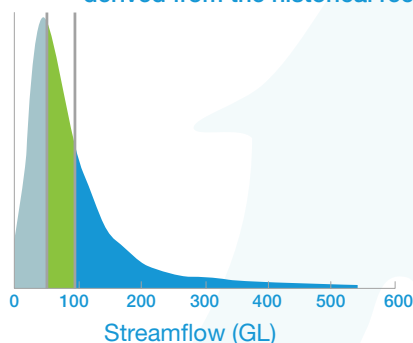


Figure 1. Forecast total Ovens River flows into Murray River during period: March – May 2010

How are these forecasts different?

The Bureau's flood forecasting service has operated for many years during high streamflow events. But the short-term water forecasting service will operate continuously during periods of both low and high flows.

While flood forecasts are currently issued mainly for flood-prone or high risk locations, these new forecasts will target key water management locations and water control infrastructure including water storages.

Next steps in development

These new services rely on the Bureau's substantial research partnerships with CSIRO under WIRADA and with the Centre for Australian Weather and Climate Research (CAWCR). Close collaboration with the eWater Cooperative Research Centre and various universities is also important.

The Bureau is working closely with governments, water resource managers and water users to identify their forecasting service requirements. Feedback and input is also being sought during the development process. Modelling infrastructure will be built in stages to support the new services.

Implementation

A short-term water forecasting service is being developed and tested for the Ovens River in Victoria and piloted at further locations throughout 2010 and 2011.

The Bureau issued its first experimental seasonal streamflow forecasts for 11 sites in the southern Murray-Darling Basin in December 2009. This was followed by further forecasts for flows into other major rivers and storages. The Bureau expects to begin running an operational service from early 2011. Forecasts and related information will be available through the Bureau's website at www.bom.gov.au/water.

Please contact us at waterinfo@bom.gov.au with your feedback and comments.